Journal of Quantitative Spectroscopy & Radiative Transfer

List of Contents and Author Index
Volume 44, 1990

PERGAMON PRESS

OXFORD · NEW YORK BEIJING · FRANKFURT
SÃO PAULO · SYDNEY · TOKYO · TORONTO

JOURNAL OF QUANTITATIVE SPECTROSCOPY & RADIATIVE TRANSFER

Editor
Professor S. S. Penner, *Energy Center, 0310, University of California (San Diego), 9500 Gilman Drive, La Jolla, CA 92093-0310, U.S.A.*

Associate Editors

Term ending 31 December 1990

J. O. Arnold, *Physical Sciences Br., NASA, AMES Research Center, Mail Stop STS: 230-3, Moffett Field, CA 94035, U.S.A.*

J.-P. Bouanich, *Laboratoire d'Infrarouge Associé au C.N.R.S., Université de Paris-Sud, Bâtiment 350, 91405 Orsay Cedex, France*

M. Cattani, *Instituto de Fisica da Universidade de São Paulo, C. P. 20516, São Paulo, Brazil*

A. L. Crosbie, *Thermal Radiative Transfer Group, Department of Mechanical and Aerospace Engineering, University of Missouri-Rolla, Rolla, MO 65401, U.S.A.*

J. Davis, *Plasma Dynamics Branch, Naval Research Laboratory, Washington, DC 20375, U.S.A.*

A. Karp, *IBM Systems Center, 18100 Frederick Pike, Gaithersburg, MD 20879, U.S.A.*

R. W. Lee, *Lawrence Livermore National Laboratory, P. O. Box 808, Livermore, CA 94550, U.S.A.*

D. Mihalas, *Department of Astronomy, University of Illinois, 103 Astronomy Building, 1002 West Green Street, Urbana, IL 61801, U.S.A.*

J. Migdałek, *Institute of Physics, Pedagogical University of Krakow, 2 Podchorazyck Street, 30-084 Krakow, Poland*

C. E. Siewert, *Department of Mathematics, North Carolina State University, Raleigh, NC 27695-8205, U.S.A.*

P. Varanasi, *Institute for Terrestrial and Planetary Atmospheres, State University of New York, Stony Brook, NY 11794-2300, U.S.A.*

W. Whaling, *Department of Physics, California Institute of Technology, Pasadena, CA 91125, U.S.A.*

Term ending 31 December 1991

D. Burgess, *Department of Physics, Imperial College of Science and Technology, London, U.K.*

H. Domke, *Central Institute for Astrophysics, DDR-1591 Potsdam, G.D.R.*

H. W. Drawin, *Association EURATOM-CEA, D.R.F.C., CEN-CADARACHE, BP. 1, F-13108 - St Paul Les Durance Cedex, France*

K. Fox, *Science Applications International Corp., Washington, DC 20024, U.S.A. and University of Tennessee, Knoxville, TN 37996-1200, U.S.A.*

H. R. Griem, *Department of Physics and Astronomy, University of Maryland, College Park, MD 20740, U.S.A.*

P. Kunasz, *Joint Institute for Laboratory Astrophysics, University of Colorado, Boulder, CO 80302, U.S.A.*

B. R. Lewis, *Research School of Physical Sciences, The Australian National University, Canberra, Australia 2600*

G. Münch, *Direktor, Max-Planck-Institut für Astronomie, 6900 Heidelberg 1, Königstuhl, F.R.G.*

R. W. Nicholls, *Centre for Research in Experimental Space Sciences, York University, 4700 Keele Street, Downsview, Ontario, Canada M3J 1P3*

G. C. Pomraning, *School of Engineering and Applied Science, University of California, Los Angeles, CA 90024, U.S.A.*

N. N. Sobolev, *P. N. Lebedev Physical Institute of the U.S.S.R. Academy of Sciences, Leninsky Prospect 53, Moscow, U.S.S.R.*

B. van der Sijde, *Eindhoven University of Technology, Department of Physics, P. O. Box 513, 5600 MB Eindhoven, The Netherlands*

W. L. Wiese, *National Measurements Laboratory, National Bureau of Standards, Washington, DC 20234, U.S.A.*

Term ending 31 December 1992

G. Birnbaum, *National Bureau of Standards, Office of Nondestructive Evaluation, Building 223, Room B344, Gaithersburg, MD 20899, U.S.A.*

Y. Ben-Aryeh, *Department of Physics, Technion-Israel Institute of Technology, 32000 Technion City, Haifa, Israel*

J. Cooper, *Joint Institute for Laboratory Astrophysics, University of Colorado, Boulder, CO 80309, U.S.A.*

R. K. Hanson, *High Temperature Gasdynamics Laboratory, Department of Mechanical Engineering, Stanford University, Stanford, CA 94305, U.S.A.*

P. Heinzel, *Astronomical Institute of the Czechoslovak Academy of Sciences, 251 65 Ondrejov, Czechosiovakia*

K. Kamiuto, *Solar Energy Thermal Applications Laboratory, Oita University, Oita 8700-11, Japan*

D. Robert, *Laboratoire de Physique Moléculaire, CNRS UA 772, Université de Franche-Comté, 25030 Besançon Cedex, France*

H. K. Roscoe, *Natural Environment Research Council, British Antarctic Survey, High Cross, Madingley Road, Cambridge CB3 0ET, U.K.*

H. Schlüter, *Institut für Experimentalphysik, Ruhr-Universität Bochum, Gebäude NB 5/131, 4630 Bochum 1, F.R.G.*

I. I. Sobelmann, *P. N. Lebedev Physical Institute of the U.S.S.R. Academy of Sciences, Leninsky Prospect 53, Moscow, U.S.S.R.*

C. L. Tien, *Chancellor, University of California, Berkeley, CA 94720, U.S.A.*

Publishing Office: Journals Production Unit, Pergamon Press plc, Hennock Road, Marsh Barton, Exeter, Devon EX2 8NE, England (*Tel.* Exeter (0392) 51558; *Fax* 425370).

Subscription and Advertising Offices: *North America:* Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, NY 10523, U.S.A.; *Rest of the World:* Pergamon Press plc, Headington Hill Hall, Oxford OX3 0BW, England (*Tel.* Oxford (0865) 794141).

Subscription Rates: annual institutional subscription rate (1991) DM 1710.00; 2-year institutional rate (1991/92) DM 3249.00; personal subscription rate for those whose library subscribes at the regular rate (1991) DM 209. Prices are subject to amendment without notice.

Back Issues: Back issues of all previously published volumes, in both hard copy and in microform are available direct from Pergamon Press offices.

Published Monthly—Two volumes per annum. Copyright © 1990 Pergamon Press plc

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

Photocopying information for users in the U.S.A.: The Item-fee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copying, beyond that permitted by Section 107 or 108 of the United States Copyright Law, is paid. The appropriate remittance of $3.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 27 Congress Street, Salem, MA 01970, U.S.A.

Permission for other use: The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher for such copying. *The Item-fee Code for this publication is* 0022-4073/90 $3.00 + 0.00

©™The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48-1984.

List of Contents

NUMBER 1

SPECTRAL LINE FORMATION IN PLASMAS UNDER EXTREME OR UNUSUAL CONDITIONS

Aims of the Conference vii

Plasma Electric Fields

G. Kalman and **P. Bakshi** 1 Microfield effects: strongly coupled plasmas

Bernard Held 11 Correlations and microfields in dense plasmas

R. Stamm, A. Calisti, P. Kaftandjian, and **B. Talin** 19 Simulation microfield method for plasma spectroscopy

M. A. Berkovsky and **Yu. K. Kurilenkov** 25 On longitudinal oscillations in strongly coupled plasmas

G. Pelletier 31 The occurrence of strong electrostatic turbulence under various experimental conditions

Diagnostics of Laboratory Plasmas

B. van der Sijde and **J. A. M. van der Mullen** 39 Temperature determination in non-LTE plasmas

J. Uhlenbusch and **W. Viöl** 47 H_β-line profile measurements in optical discharges

S. Suckewer, C. H. Nam, W. Tighe, U. Feldman, J. Seely, and **L. A. Woltz** 57 Spectra from plasma created by very high intensity picosecond laser

N. Spector, Y. Levinson, A. Loeb, and **Z. Kaplan** 59 Spectroscopic diagnostics of the characteristics of an electrothermal gun free jet plasma

N. Konjević and **N. I. Uzelac** 61 A review of the Stark widths and shifts of spectral lines from non-hydrogenic atoms and ions in weakly-coupled plasmas and experimental results for XeI and XeII lines

G. Jamelot, P. Jaegle, P. Lemaire, and **A. Carillon** 71 Experimental study of the role of plasma polarization on line shape in dense laboratory plasmas

C. F. Hooper, Jr., L. A. Woltz, R. C. Mancini, N. D. Delamater, M. C. Richardson, and **R. L. Kauffman** 79 Laser-driven implosions of Ne/Ar and Ar/Kr gas-filled microballoons: spectroscopic analysis

Spectral Line Formation and Broadening

P. Bakshi and **G. Kalman** 93 Hydrogenic spectroscopy for various unusual plasmas

D. E. Kelleher, D. H. Oza, J. Cooper, and **R. L. Greene**	101	An overview of the ion dynamic effect in line broadening, and a generalization of the unified theory
C. Deutsch and **D. Vanderhaegen**	109	Line broadening by low-frequency turbulence
James W. Dufty, David B. Boercker, and **Carlos A. Iglesias**	115	Models for spectral line shapes from ions in strongly coupled plasmas
L. G. D'yachkov, G. A. Kobzev, and **P. M. Pankratov**	123	The disappearance of upper members of spectral series in dense plasmas
T. D. Beynon and **D. K. K. Landeg**	129	Scattering resonances in dense plasmas
C. Stehlé	135	What is meant by low or high densities in the Stark broadening of hydrogenic ion lines?
G. Mathys	143	The transfer of polarized light in Stark broadened hydrogen lines in the presence of a magnetic field
Samuel Goldsmith	153	Plasma polarization shift of the Lyman-α line in C VI, N VII, and O VIII
J. Oxenius	157	Non-LTE line transfer
B. Baschek and **R. Wehrse**	159	Line radiation from media with random source functions
C. Deutsch and **D. Vanderhaegen**	163	Radiative transfer in statistically heterogeneous mixtures
Astrophysical Plasmas		
V. M. Tomozov	171	Turbulent Stark effect: possible observational manifestations in solar flares
N. M. Firstova	177	Observational aspects of the study of plasma turbulence in solar flares
Petr Heinzel	185	Formation of hydrogen lines under the influence of turbulent electric fields in solar flares
J. C. Hénoux and **G. Chambe**	193	H_α impact polarization observed in solar flares as a diagnostic of energy transport mechanisms
N. N. Ljepojevic	203	Electron velocity distribution function in a fully ionized plasma slab with a large temperature gradient: solar flare transition region
F. Allard and **R. Wehrse**	209	Line formation in white dwarf atmospheres
B. Baschek and **S. Johansson**	215	FeII lines from laboratory and astrophysical sources

NUMBER 2

W. A. Lahoz	217	An exact solution of Chandrasekhar's X- and Y-functions
S. M. El-Sheikh, G. C. Tabisz, F. Barocchi, A. Guasti, and **M. Zoppi**	225	Birnbaum–Cohen lineshape description of the collision-induced light scattering by CH_4
E. Biémont and **P. Quinet**	233	Energy levels and oscillator strengths for gallium-like ions (Br V–In XIX)
K. Benzerhouni, C. Meyer, J. Dupre, J. Walrand, F. Derie, and **G. Blanquet**	245	Intensity measurements in the ν_8-band of propyne
J. W. Thornhill, K. G. Whitney, and **J. Davis**	251	Transition from I^4 to I^2 scaling of K-shell emission in aluminum array implosions
T. Lüdtke and **V. Helbig**	261	Absolute transition probabilities for spectral lines of the argon II $4s$–$4p$ and $3d$–$4p$ transition array
S. O. Kastner and **Ruth E. Kastner**	275	Opacity ratios for Doppler-broadened lines from common upper levels
B. Ganapol	289	Numerical treatment of the half-space problem of radiative transfer
A. L. Crosbie and **S. M. Shieh**	299	Three-dimensional radiative transfer for anisotropic scattering medium with refractive index greater than unity
Note		
W. A. Lahoz	313	On the exact linearization of certain non-linear integral equations arising in radiative transfer theory
Software Survey Section	I	DDSCAT

NUMBER 3

G. C. Pomraning	317	Near-infinite-medium solutions of the equation of transfer
Zhenming Wang and **Robert J. Kearney**	339	Rayleigh scattering from an argon plasma jet at atmospheric pressure
S. J. Wilson and **T. R. Nanda**	345	Radiative transfer in absorbing, emitting and linearly anisotropically scattering inhomogeneous solid spheres
J. Oxenius and **E. Simonneau**	351	The collision term for collisional ionization and three-body recombination
F. E. Irons	361	Clarification of Sobolev's derivation of the escape-probability method of radiative transfer

Lynne M. Hitchcock, Gyung-Soo Kim, Gene P. Reck, and Erhard W. Rothe — 373 — Absorption of laser light in air in the 193 nm range: analysis of laser locking

NUMBER 4

Guang Ma, Masako Suto, and L. C. Lee — 379 — Fluorescence from excitation of CH_4, CH_3OH and CH_3SH by extreme vacuum ultraviolet radiation

J. P. Bouanich, C. Brodbeck, Nguyen-Van-Thanh, and P. Drossart — 393 — Collision-induced absorption by H_2–H_2 and H_2–He pairs in the fundamental band—an experimental study

S. Djeniže, A. Srećković, M. Platiša, J. Labat, R. Konjević, and J. Purić — 405 — Stark broadening and shift of neutral and singly-ionized mercury lines

T. N. Chang and Yi Mu — 413 — Energy levels and transition probabilities of bound excited states of Be-like N IV

M. S. Dimitrijević and S. Sahal-Bréchot — 421 — Stark broadening of Na(I) lines with the principal quantum number of the upper state between 6 and 10

John D. Hey and Jacqueline E. King — 433 — Spectroscopic study of a Wood's tube discharge in hydrogen

NUMBER 5/6

RADIATION AND SPECTROSCOPY OF PULSE-POWER-DRIVEN PLASMAS

Guest Editorial — v

M. C. Coulter, K. G. Whitney, and J. W. Thornhill — 443 — A new procedure for analyzing X-ray spectra from laboratory plasmas

C. Deeney, T. Nash, P. D. Lepell, K. Childers, M. Krishnan, K. G. Whitney, and J. W. Thornhill — 457 — Radius scaling effects in nickel wire array Z-pinches

J. L. Giuliani, Jr., J. E. Rogerson, C. Deeney, T. Nash, R. R. Prasad, and M. Krishnan — 471 — Aluminum wire array implosions: comparison of experiments and simulation

T. Nash, C. Deeney, M. Krishnan, R. R. Prasad, P. D. Lepell, and L. Warren — 485 — Selected properties of terawatt Z-pinches from temporally and spatially resolved spectroscopy

P. G. Burkhalter, G. Mehlman, J. P. Apruzese, D. A. Newman, V. E. Scherrer, F. C. Young, S. J. Stephanakis, and **D. D. Hinshelwood**	495	Quantitative X-ray spectroscopy of sodium Z-pinch plasmas for Na/Ne photopumping
N. Loter, M. Gersten, R. Grandey, J. Rauch, K. Ware, M. Coulter, J. Davis, and **K. Whitney**	509	X-pinch wire load experiments on BLACKJACK 5
N. Qi, D. A. Hammer, D. H. Kalantar, G. D. Rondeau, M. C. Richardson, and **H. Chen**	519	Characterization of X-ray emission from aluminum X-pinch plasmas driven by the 0.5 TW LION accelerator
J. P. Apruzese and **P. C. Kepple**	529	Calculation of the line emission from cylindrical krypton plasmas using a 162-level, 511-line detailed configuration atomic model
J. D. Perez and **B. A. Watson**	541	Small hollow cylinders as Z-pinch plasmas
S. S. Churilov, L. A. Dorokhin, K. N. Koshelev, and **Yu V. Sidelnikov**	553	Intense line source in the extreme VUV based on the micropinch in the low inductance vacuum spark
F. B. Rosmej, A. Schulz, K. N. Koshelev, and **H.-J. Kunze**	559	Asymmetric repumping of the Lyman-alpha components of hydrogen-like ions in a dense expanding plasma
Eugène J. Clothiaux	567	Spectroscopic observations of an arc-plasma accelerator
E. J. T. Burns	573	XUV radiation from gold exploding pusher targets irradiated with protons